

WATER QUALITY M E M O R A N D U M

Utah Coal Regulatory Program

February 25, 2010

TO: Internal File

THRU: James D. Smith, Permit Supervisor *JS 03/02/10*

FROM: Steve Christensen, Environmental Scientist *SKC*

RE: 2008 Fourth Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, WQ08-4, Task ID #3141

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan*. Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

On August 6th, 2007, a major mine bump/bounce occurred in the Main West pillar section causing much of the working area of the mine to collapse. As a result, mining operations at the mine have ceased. The in-mine dewatering pumps were removed and temporary concrete block seals were constructed in the north portals.

Based on Division of Oil, Gas and Mining records (the Division), the mine encountered significant amounts of ground water and began pumping activities in 1996. Over a 14-year period, the mine pumped an average of 742 gallons of water from the mine workings. Following the mine collapse and subsequent sealing of the portals, the mine did not discharge for the months of October, November and December of 2007. However, by mid January of 2008 the mine had filled to the extent that the mine-water had found it's way around the temporary seals and began to discharge uncontrolled to the surface.

During the 1st quarter of 2008, spikes in Total Dissolved Solids (TDS) and Total Iron (T-Fe) were detected during Utah Pollutant Discharge Elimination System (UPDES) sampling of the mine water discharge (Outfall 002). However, the analytical results for both TDS and T-Fe for both the 2nd and 3rd quarter of 2008 were within the compliance limits established in the Permittee's UPDES discharge permit.

The 4th quarter analytical results for the mine-water discharge produced elevated levels of T-Fe while TDS levels stayed within compliance levels. See '*data irregularity*' section below for more discussion.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs require quarterly monitoring of field parameters (flow, pH, specific conductance and temperature).

The Permittee submitted all required samples for the spring sites.

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

The Permittee submitted all required samples for the stream sites.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been temporarily sealed off thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

The Permittee submitted all required samples per the terms of the UPDES discharge permit. Outfall 001 did not discharge during the 2nd quarter of 2008. Outfall 002 discharged an average of 477 gallons per minute (gpm) based on 3 sampling events conducted during the quarter.

2. Were all required parameters reported for each site? YES ☒ NO ☐

3. Were any irregularities found in the data?

YES ☒ NO ☐

As previously discussed, following the sealing of the north portals, the mine did not discharge for the months of October, November and December of 2007. However in January of 2008, the mine-water began to discharge from around the temporarily constructed seals in the north portals. The Permittee constructed a series of drains adjacent to the temporary seals and was successful in routing the mine-water discharge directly into Crandall Creek as was done previously during active mining operations.

During the 1st quarter of 2008, 4 of 6 sampling events produced analytical results that were outside the compliance levels established by the Permittee's UPDES permit. The compliance level for T-Fe (as established by the UPDES discharge permit) is 1 part-per-million (ppm). The sampling events of January 28th and March 3rd of 2008 produced T-Fe analytical results of 1.491 ppm and 1.85 ppm respectively for T-Fe. The compliance level for TDS (as established by the UPDES discharge permit) is 1,200 ppm. The sampling events of January 10th and January 28th of 2008 produced analytical results of 1,523 ppm and 1,108 ppm respectively for TDS.

However, during the 2nd and 3rd quarters of 2008, analytical results obtained for TDS and T-Fe from the mine-water discharge were within the compliance levels established by the UPDES discharge permit (1.0 ppm for T-Fe and 1,200 ppm for TDS).

The 4th quarter analytical results of the mine-water discharge produced elevated levels of T-Fe, while TDS levels remained within compliance levels. Two of three sampling events produced T-Fe values higher than the 1.0 ppm range established in the UPDES permit (1.59 ppm and 1.335 ppm). All three sampling events produced TDS levels well below the 1,200 ppm compliance level (772 ppm, 786 ppm and 819 ppm).

TDS and T-Fe levels obtained from the lower Crandall Creek Flume (Site LOF-1) were similar to the mine-water discharge results. TDS levels were well within the UPDES compliance range and water equality standard (722 ppm). The water quality standard for TDS in Crandall Creek (as established by the Division of Water Quality) is 4,800 ppm for TDS.

However, the T-Fe level obtained at Site LOF-1 (1.438 ppm) was well above the 1 ppm standard established in the UPDES permit. It's clear that the T-Fe contained within the mine-water discharge is producing a detectable increase further downstream from the outlet of Outfall 002.

Spring SP-58 produced several analytical results that were outside 2 standard deviations: D-Na (2.72 standard deviations), SO4 (2.41 standard deviations) and TDS (2.01 standard deviations). (See Attached Chart)

4. On what date does the MRP require a five-year re-sampling of baseline water data.

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

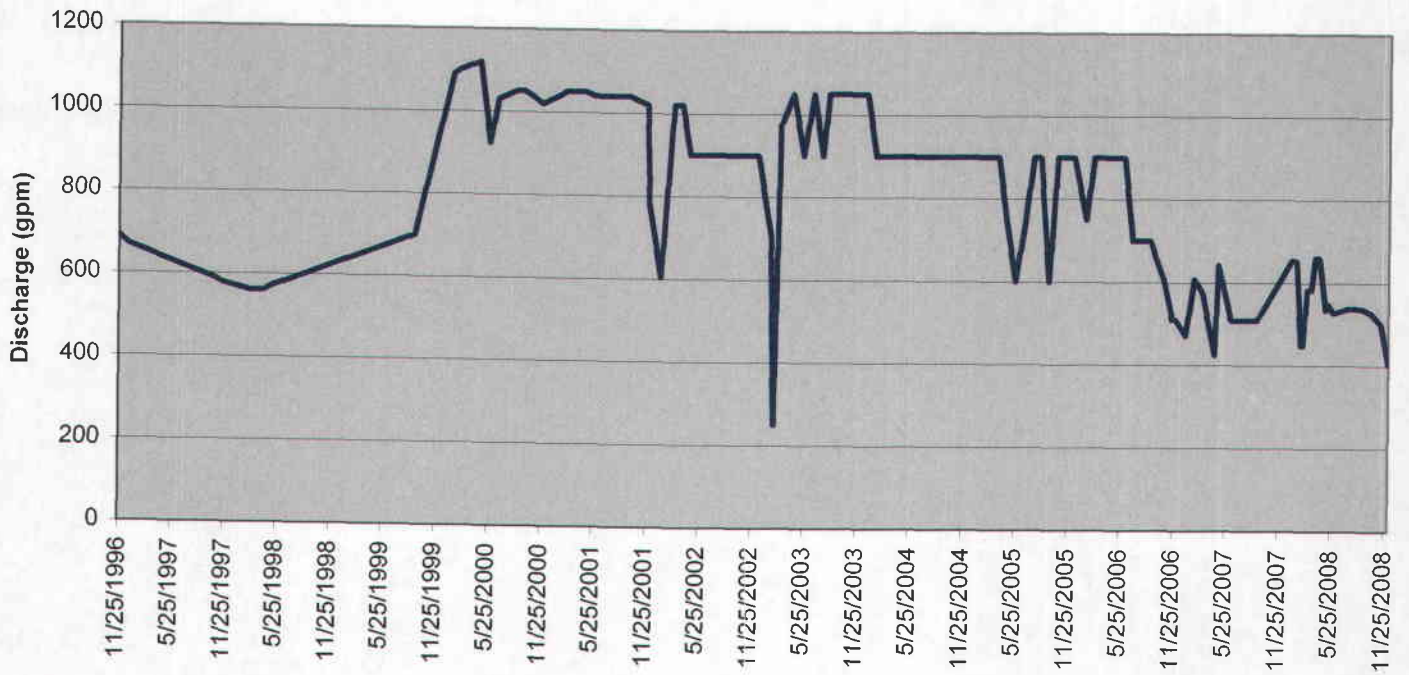
Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

5. Based on your review, what further actions, if any, do you recommend?

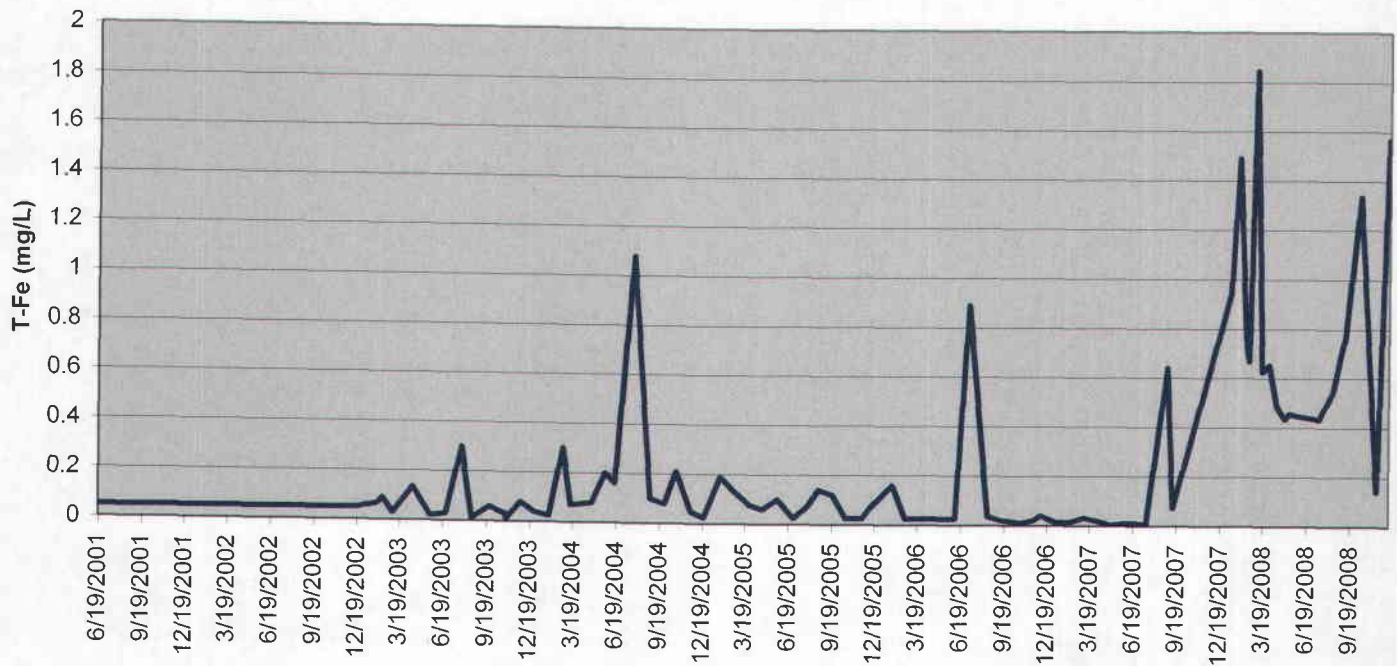
Continued data collection and monitoring of the mine-water discharge will be necessary to determine if a trend is emerging relative to TDS and T-Fe. The data will be essential in determining whether the mine-water discharge remains in compliance with the UPDES permit.

SP-58 will be examined thoroughly going forward. Dissolved sodium (D-Na) is trending significantly upward.

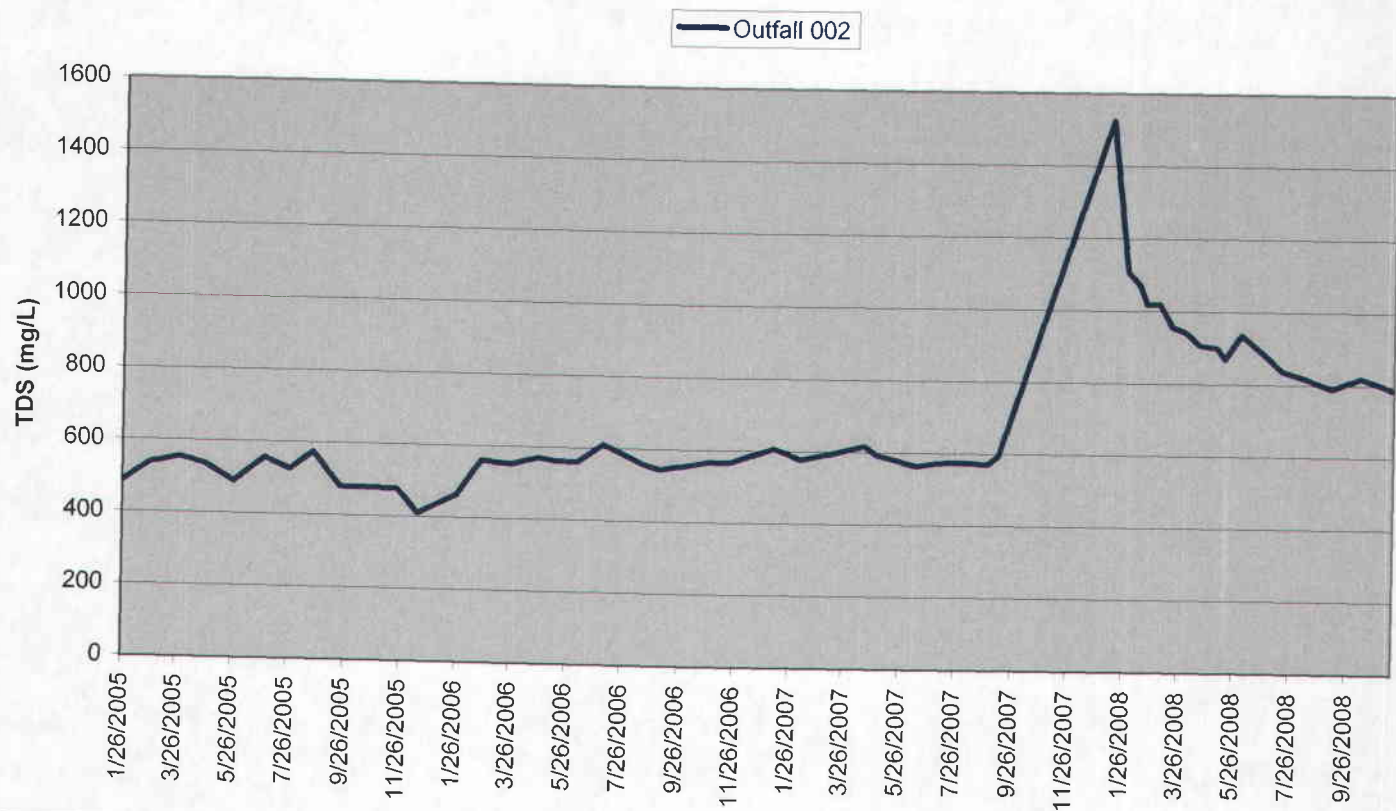
Mine Water Discharge (Outfall 002)



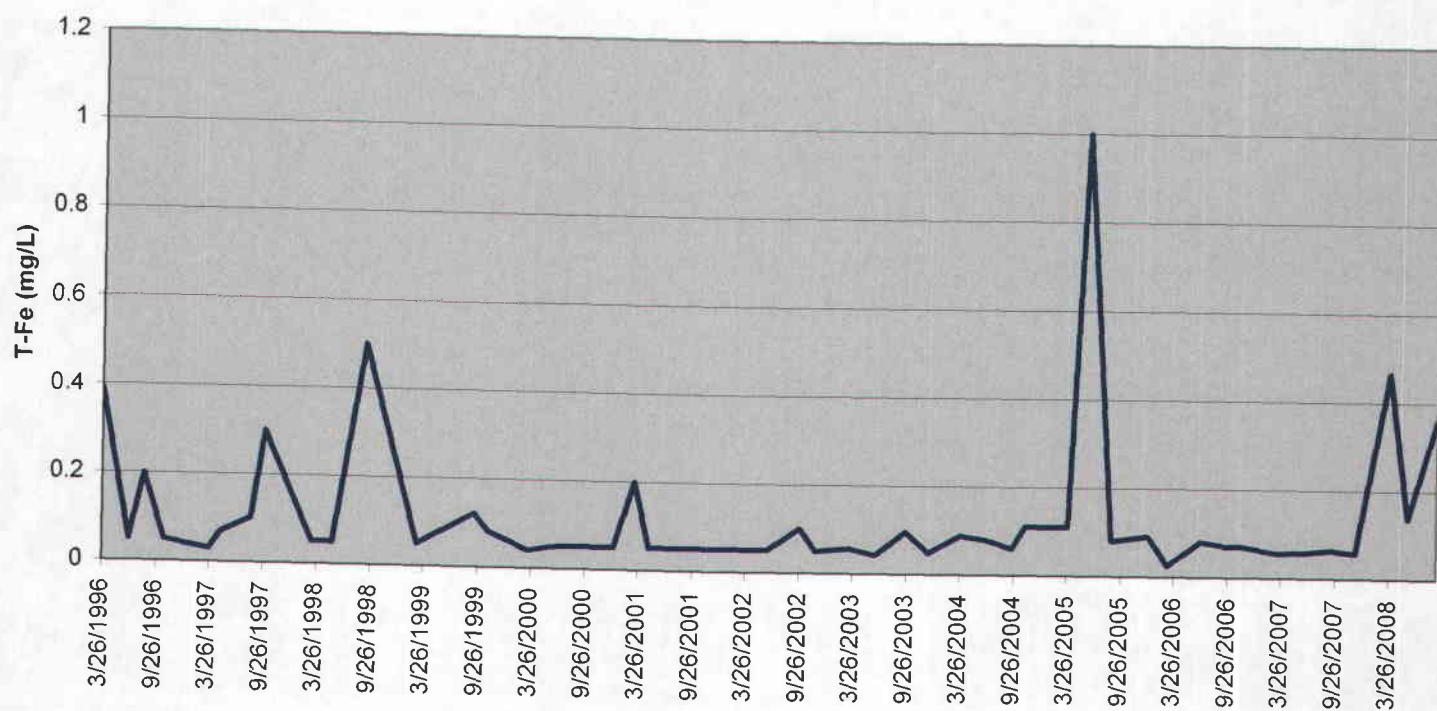
Total Iron (T-Fe): Outfall 002



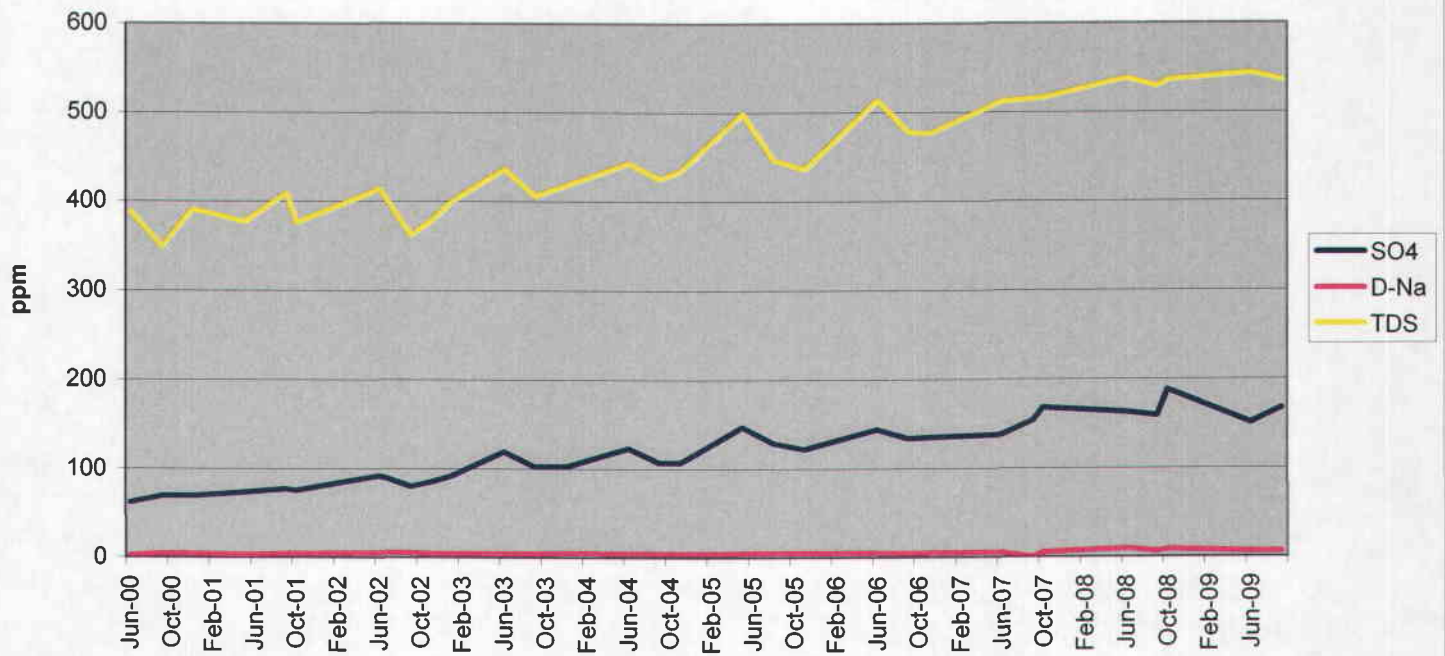
Total Dissolved Solids (TDS)



Crandall Creek Lower Flume (LOF-1): Total Iron Levels



Spring SP-58 Water Quality



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